SPI-M-O: Statement on "Bubbles"

Date: 13th May 2020

SIGNED OFF BY CO-CHAIRS BASED ON RESULTS FROM THREE MODELLING GROUPS

Summary

1. Clustering of additional contacts within social bubbles can be an effective means of controlling any increase in R_t while allowing more contacts. Current measures have created bubbles of one household.

2. Allowing bubbles to span across small households, even with very high uptake, will have a measurable but not particularly large effect on R_t.

3. All results presented here are based on the social distancing measures in place as of 13th May 2020, including school closures.

4. Some targeted approaches will only generate a marginal increase in R_t, including pairing of single-occupancy households. Strategies pairing dual-occupancy households, or a single-person household with another of any size, are also unlikely to increase R_t above one, providing that overall reproduction number before their introduction is around 0.8 or less.

5. Bubbles involving larger households are more likely to result in R_t increasing above one. This may be mitigated if restricted to single parents with a primary school age child joining with other households including primary age children.

6. The impact of a policy on bubbling is highly dependent on several factors, including but not limited to the size and nature of bubbles; uptake of bubbling by households; the interaction with other policies in place; and how strictly rules about exclusivity of bubbles are adhered to.

7. Any policy on bubbling needs to consider the degree of risk for occupants of households that may be involved in bubbling. For example, a household of one or two vulnerable people will be at significantly higher risk when bubbling than a younger couple, single person, or even single parent with a child or young children.

8. Bubbling of small households makes a return to exponential growth of the epidemic more likely than with no bubbling, but not by much.

Background

9. "Bubbling" describes a policy where people living in small, non-overlapping, groups of households are permitted to come into contact with one another. This has the effect of creating one large household out of two or more smaller households.

General principles for bubbling

10. This note builds upon the general principles for bubbling set out in "*SPI-M-O: Statement on COVID-19 – "Bubbles" and outdoor activities*", as tabled at SAGE 34 (7th May 2020).

11. **In order to be effective, no person can be a member of more than one bubble, all individuals in one household must belong to the same bubble, and the bubble must contain the same individuals for the foreseeable future**. Even small breaches of bubbles bring a significant risk of increasing transmission.

12. For bubbles to be effective, policies on household quarantine would need to apply to all members of the bubble. For example, if one member of the bubble develops symptoms, all members of the bubble would be expected to quarantine, not just those in the same household.

Insights from modelling

Main insights

13. Three modelling groups (Bristol/Exeter; Warwick/LSHTM; Manchester/Warwick/IBM) considered the impact of bubbles on network connectivity and the reproduction number or growth rate. Analyses focused primarily on bubbles involving single-occupancy or two-person households.

14. All models assume adherence to the proposed bubbling scenario (e.g. exclusivity of bubbles and no bubbling involving multiple large households), and do not account for additional behavioural responses such as changes to adherence to social distancing or increased work contacts. It is also assumed that existing policies on shielding of clinically vulnerable groups continues to apply.

15. Non-adherence will increase the risk and impact of bubbling on R_t. However, it is likely that some groups are already in effective bubbles – in some cases legitimately (such as a child under 18 moving between parents/guardians in two separate households).

16. Bubbles generated by pairing of single-occupancy households (i.e. 1+1) are likely to have a relatively small impact on the epidemic.

17. Assuming a current net reproduction number (R_t) of around 0.8 or less, strategies exclusively involving small households (one or two person), or a single-person household with another of any size, are unlikely to increase R_t above one.

18. Bubbles involving a two-person household joining another of any size are more likely to result in R_t increasing above 1. However, if this is restricted to single parents with a primary school age child, such two-person households may be able to bubble with another household including primary age children with only a small increase in transmission.

19. Similarly, bubbles involving larger households were shown to have a larger impact on transmission.

20. This analysis provides indicative insights on the *relative* impact of bubbling strategies, and should not be taken as a definitive assessment on whether particular scenarios are epidemiologically sound. Any change to policy will need to be considered alongside other changes to social distancing.

21. The impact of bubbling will be dependent on measures elsewhere in the community, and adherence to these measures. As other measures are relaxed, the estimated impact of bubbling rapidly increases.

22. Similarly, as adherence to household or bubble quarantine falls, transmission and the growth rate of infections increases. The impact of bubbling also increases with higher assumed secondary attack rates. If transmission rates between households in the bubble are lower than those within individual households, then the impact of bubbling is lessened.

Discussion

23. Allowing bubbles to form would increase the risk of infection to their members and amplifies the effects of random transmission between households, potentially increasing the spread of infection.

24. The probability of a household, or bubble, of size n becoming infected scales in line with $1-(1-p)^n$, where p is the probability that one person becomes infected from outside the household. As the size (n) and individual risk of bubble members increases, so too does the likelihood of the bubble becoming infected.

25. As such, the impact of a bubbling policy on the epidemic will be highly dependent on the uptake and choice of household bubbles (i.e. individuals involved), which in turn will be influenced by demographics and household composition, as described by SPI-B in their accompanying paper.

26. All three models assumed that households formed bubbles at random. However, it is likely that households will be motivated to bubble with households to share caring or childcare responsibilities, or to reduce social isolation.

27. Households may also choose to avoid bubbling with groups perceived to be at higher risk in terms of contact patterns or clinical vulnerability (e.g. key workers and those shielding respectively). This would reduce any negative impact of introducing bubbles.

28. There is a clear differential in the individual risk from bubbling: a household of one or two vulnerable people will be at significantly higher risk when bubbling than a younger couple, single person, or even single parent with a child or young children.

29. Interaction within a bubble, however, is less risky than lots of small contacts outside of it. For example, one shielded family member living alone with one other family household connected with them would be at lower risk of infection than that shielding person having lots of small contacts with multiple individuals from multiple households.

30. Any policy needs to carefully consider guidance on bubbling for elderly and clinically vulnerable groups. Even if implementation of a bubbling policy did not result in a R_t above one, it could lead to an increase in severe cases and hospitalisations if risks for vulnerable groups increased.

31. In general, the three models made the conservative assumption of 100% uptake. However, uptake of bubbling is likely to be lower, as seen in New Zealand.

32. The potential magnitude of impact will also be highly dependent on the exact policy announced. For example, a bubbling policy restricted to one-person households will be limited to the approximately 29% of UK households which are of that size. As the proposed range of bubbling increases (e.g. by size of households or number of individuals), so will the population in scope.

Table 1: Households in the UK by size (2019)[1]

A household is defined as one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area.

Number of households *(thousands)*	**2019**	
	Estimate	**%**
One person	8,197	29%
Two people	9,609	35%
Three people	4,287	15%
Four people	3,881	14%
Five people	1,254	5%
Six or more people	597	2%
All households	27,824	

Average household size (number of people)	2.37

33. If the Government further advises that bubbling is for specific purposes (e.g. supporting the most isolated), or that those who are shielding or clinically vulnerable should generally not bubble – then this may further limit the population in scope.

34. It may be possible that uptake of bubbling is muted in certain demographics due to previous responses – for example: the interventions implemented in March may have already encouraged partners to move in together.

35. As with many non-pharmaceutical interventions, behavioural adherence is vital in preventing excessive further transmission. Adopting any of the above measures could change people's behaviours in other ways that we cannot predict, leading to indirect changes to transmission rates, which have not been considered here. Even small breaches of bubbles are likely to remove their effect on slowing transmission. Clear messaging would be required to ensure people understand what is and isn't permitted, and how risk rises with the number of people in the bubble.

[1] ONS (2019) Families and households in the UK; Labour Force Survey (Table 5: Households by size) https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/familiesandhouseholdsfamiliesandhouseholds